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New records of *Ascomycota* from tropical dry forest in Sonora, Mexico

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Abstract—Eight new records of ascomycetes from Sierra de Álamos-Río Cuchujaqui Biosphere Reserve in Sonora, Mexico are reported. *Hypoxylon anomalum* and *Munkovalsaria donacina* represent new records for Mexico, while *Bionectria byssicola*, *Fracchiaea heterogenea*, *Hypoxylon lenormandii*, *Lasiodiplodia theobromae*, *Peroneutypa scoparia*, and *Pseudocosmospora vilior* are new records for Sonora.

Key words—*Botryosphaeriales, Coronophorales, Hypocreales, Xylariales*

Introduction

The Sierra de Álamos-Río Cuchujaqui Biosphere Reserve (ACBR) presents an extraordinary biological richness, with more than 1200 plant species in an area of 92,899 ha. It is located in the south of Sonora, Mexico, preserving part of the North American tropical dry forest intermixed with xerophilous scrub, oak-pine forest, and riparian vegetation (SEMARNAT 2015). Its floral and faunal components have been studied by Robichaux & Yetman (2000).

Twenty-two ascomycetes been recorded previously from ACBR: *Anteaglonium abbreviatum* (Schwein.) Mugambi & Huhndorf [≡ *Glonium abbreviatum* (Schwein.) M.L. Lohman], *Biscogniauxia nummularia* (Bull.)

Kuntze, *Daldinia clavata* Henn., *D. concentrica* (Bolton) Ces. & De Not., *D. eschscholtzii* (Ehrenb.) Rehm, *H. ferrugineum* G.H. Otth [≡ *H. rubiginosum* var. *ferrugineum* (G.H. Otth) J.H. Mill.], *D. fissa* Lloyd, *D. loculata* (Lév.) Sacc., *Hypoxylon anthochroum* Berk. & Broome, *H. haematostroma* Mont., *H. polyporus* (Starbäck) Y.M. Ju & J.D. Rogers, *H. rubiginosum* (Pers.) Fr., *Hysterobrevium mori* (Schwein.) E. Boehm & C.L. Schoch [≡ *Hysterographium mori* (Schwein.) Rehm], *Oedohysterium insidens* (Schwein.) E. Boehm & C.L. Schoch, *Rhytidhysteron rufulum* (Spreng.) Speg., *Xylaria arbuscula* Sacc., *X. feejeensis* (Berk.) Fr., *X. microceras* (Mont.) Berk., *X. poitei* (Lév.) Fr., *X. striata* Pat., *X. striata* var. *sonorensis* F. San Martín et al., and *X. uniapiculata* F. San Martín & J.D. Rogers (Pérez-Silva et al. 1996; San Martín et al. 1999a,b; Méndez-Mayboca et al. 2010; Chacón et al. 2014). This study aims to continue the expansion of our knowledge of ascomycete diversity in the ACBR.

Materials & methods

The Sierra de Álamos-Río Cuchujaqui Biosphere Reserve was surveyed with two samplings in October of 2013 and 2014, in the localities of El Cajon (27°01′42″N 108°45′23″W, 373 m a.s.l.) and Rancho La Sierrita (26°58′25″N 108°56′42″W, 528 m a.s.l.). The collected specimens were described from fresh material, processed, and deposited in the Herbarium, Escuela Nacional de Ciencias Biológicas, Instituto Politécnico Nacional, Mexico City, Mexico (ENCB). The species were determined by observing cut sections of the ascomata in temporary preparations mounted in 70% alcohol, 10% KOH, and lactophenol with cotton blue (LB) and compared with identification keys (Aptroot 1995a,b; Ju et al. 2005; Burgess et al. 2006; Carmarán et al. 2006; Chaverri et al. 2011; Herrera et al. 2013). New records for Sonora are indicated by a single asterisk, and for Mexico with two asterisks.

Taxonomy

Dothideomycetes, Botryosphaeriales, Botryosphaeriaceae

****Lasiodiplodia theobromae*** (Pat.) Griffon & Maubl.,
Bull. Soc. Mycol. France 25: 57 (1909) Figs 1, 2

Pycnidia of (360–)470–510(–540) × (210–)350–430(–500) µm, subglobose, obpyriform to pyriform, dark brown to black, immersed in the surface of the host, erumpent when mature. Paraphyses hyaline, cylindrical, septate, occasionally branched, with rounded tips of 45–55 × 3–4 µm. Conidiogenous cells, cylindrical, hyaline, thin and smooth wall. Conidia of (19–)21–31(–32.5) × (12–)13–15.5(–18.5) µm, subovoid to ovoid-ellipsoid, broadly rounded apices tapering or truncate at the base, initially hyaline and aseptate with a thick wall,

dark olive, dark brown to black, with a transverse septum and longitudinal grooves or sulci when mature.

Specimens examined: **MEXICO**, **Sonora:** El Cajón, 14 Oct 2013, T. Raymundo 4819, 4827; Rancho La Sierrita, 15 Oct 2013, T. Raymundo 4827, D. Castro-Bustos 164.

Habitat & distribution—Widely distributed in tropical and subtropical regions, *L. theobromae* grows gregariously on decaying fruit such as *Ceiba acuminata* (S. Watson) Rose, and Alves et al. (2008) indicate that it is plurivorous. In México, it has been reported from the states of Campeche, Colima, Distrito Federal, Estado de México, Guerrero, Guanajuato, Jalisco, Michoacán, Nayarit, Puebla, Querétaro, Tabasco, Tlaxcala, and Veracruz (Medel & Chacón 1988, Cibrián-Tovar et al. 2007). This is a first record for Sonora.

Comments—*Lasiodiplodia theobromae* is recognized by its black pycnidia, immersed and erumpent when mature, which produce subovoid and dark brown conidia with conspicuous longitudinal grooves. It is considered a virulent plant pathogen of hundreds of host species around the world. In Mexico, Cibrián-Tovar et al. (2007) consider it an opportunistic fungus that attacks stressed trees and produces various toxins that could favor leaf wilt in several tropical trees. A similar species, *L. pseudotheobromae* A.J.L. Phillips et al., differs by its dark brown and slightly larger (23.5–32 × 14–8 µm) conidia and occurrence in Costa Rica on *Acacia mangium*, *Citrus aurantium*, *Coffea* sp., and *Rosa* sp. (Alves et al. 2008). *Lasiodiplodia parva* A.J.L. Phillips et al. is also similar but produces smaller (16–23 × 10–13 µm) conidia and has been recorded only on *Theobroma cacao* in Colombia and Sri Lanka (Alves et al. 2008).

Dothideomycetes,* inc. sed., *Dacampiaceae

*****Munkovalsaria donacina*** (Niessl) Aptroot,
Nova Hedwigia 60: 346 (1995) Figs 3,4

Stroma inconspicuous, pseudothecia immersed, erumpent; solitary to gregarious, globose, (125–)200–250 µm diam., with a conspicuous ostiole. Peridium a textura angularis, 10–15 µm thick, with 3–6 hyaline layers on the inner side, golden brown on the outside; pseudoparenchyma formed by subglobose to angular cells 5–6.5 µm diam. Hamathecia with numerous pseudoparaphyses, 1–2.5 µm diam., with septa spaced at intervals of 10–20 µm, anastomosing, hyaline, inamyloid. Asci bitunicate, hyaline when young, 50–70 × 6–9 µm, cylindrical-clavate, with long stipes, octosporous, obliquely uniseriate to biseriate apically when mature. Ascospores 14–17 × 6–7.6 µm,

ellipsoidal to clavate, asymmetrical with a central septum that is transverse, constricted, and slightly submedian, brown yellowish and reddish brown with two green lipid droplets when mature, with slightly sharp ends; wall thin, slightly spinose, without gelatinous cover.

Specimen examined: **MEXICO, Sonora:** El Cajón, 14 Oct 2013, E. Escudero-Leyva 244b.

Habitat & distribution—Cosmopolitan and pantropical species. Gregarious, immersed in wood of woody angiosperms, where it coexists with *Peroneutypa scoparia*. *Munkovalsaria donacina* has been reported in a variety of hosts, mainly *Acanthaceae*, *Anacardiaceae*, *Fabaceae*, *Malvaceae*, *Moraceae*, *Juglandaceae*, *Rutaceae*, and *Verbenaceae*. Reported from Africa, Asia, Australasia, Europe, North America, and South America (Aptroot 1995b). This is the first record from México.

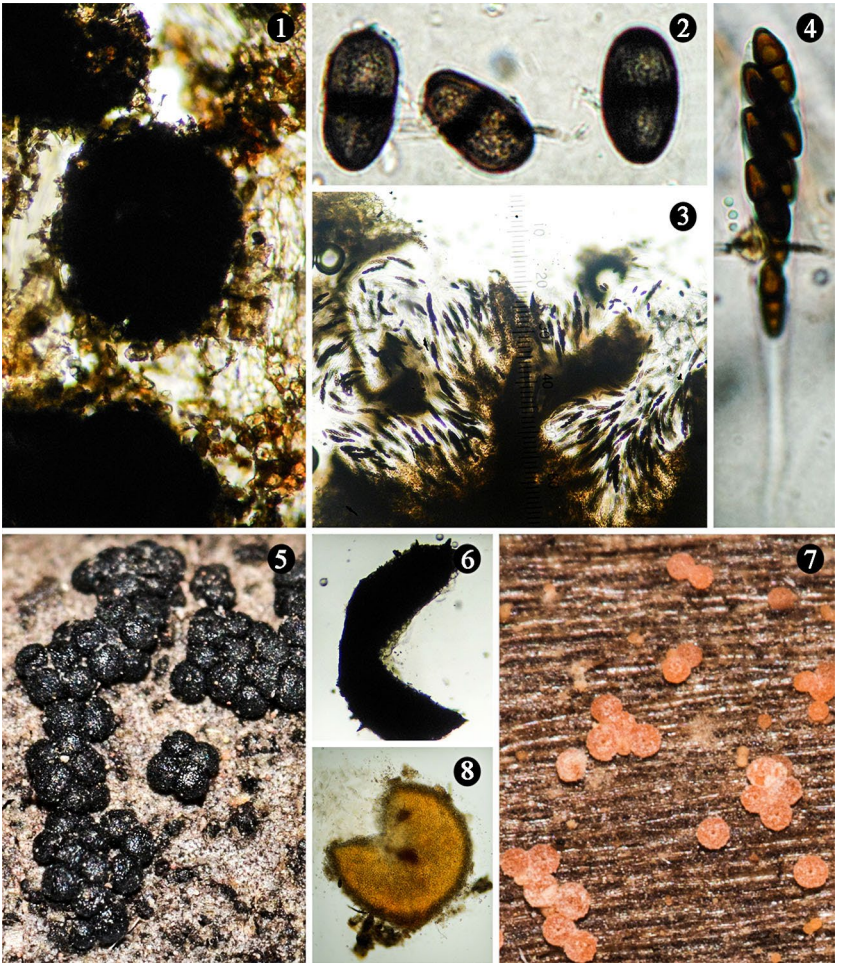
Comments—*Munkovalsaria donacina* is characterized by gregarious pseudothecia. A similar species, *M. appendiculata* Aptroot is distinguished by its ascospores (12–15 × 4–5 µm, fusiform with two hyaline polar appendages), growth on *Zea mays* in secondary vegetation, and distribution in Hong Kong (Aptroot 2004). *Didymosphaeria conoidea* Niessl is also similar but produces ascospores that are 9–12 × 4–6 µm, ellipsoidal to clavate, and with slightly sharp ends. *Munkovalsaria* is characterized by hamathecia with transversely septate pseudoparaphyses and euseptate ascospores, while *Didymosphaeria* produces hamathecia with narrow trabeculate paraphysoids and thinly distoseptate ascospores (Aptroot 1995b).

Sordariomycetes, Coronophorales, Nitschkiaceae

****Fracchiaea heterogenea*** Sacc.,

Atti. Soc. Veneto-Trentino Sci. Nat. 2: 163 (1873) Figs 5, 6

Perithecia gregarious in groups of 20–40, rarely solitary, erumpent, sessile, subglobose to globose, 500–700 µm diam., completely closed without ostiole, non-collapsing when dry, glossy black. Surface when young black verrucose with 18–25 µm long spines, becoming smooth when mature. Wall a textura angularis, with thick-walled pseudoparenchymatous cells with Munk pores. Quellkörper rudimentary. Paraphyses absent. Asci 80–100 × 15–18 µm, cylindrical, rounded at the apical end, with short stipes, multispored (≤200 ascospores), multiseriate, arranged obliquely in several longitudinal rows. Ascospores hyaline, 7.6–9 × 1.5–2 µm, cylindrical, slightly curved to allantoid, eventually with central septum and lipid droplets at the ends, walls thin and smooth.



Figs 1–8. ***Lasiodiplodia theobromae***. 1. Pycnidia. 2. Conidia. ***Munkovalsaria donacina***. 3. Pseudothecia. 4. Ascus and ascospores. ***Fracchiaea heterogenea***. 5. Perithecia in the substrate. 6. Perithecium in KOH. ***Bionectria byssicola***. 7. Perithecia in the substrate. 8. Perithecium in KOH.

Specimens examined: **MEXICO, Sonora:** Rancho La Sierrita, 15 Oct 2013, T. Raymundo 4848, R. Valenzuela 15262, D. Castro-Bustos 156.

Habitat & distribution—Cosmopolitan according to Nannfeldt (1975). *Fracchiaea heterogenea* grows on decaying branches of newly fallen trees, and is considered saprophytic and/or parasitic on other fungi. Chaverri et

al. (2011) recorded it for Costa Rica. In Mexico, it has been reported from Tamaulipas and Oaxaca (San Martín 1996, Raymundo et al. 2014). First record for Sonora.

Comments—The studied material matches the description by San Martín (1996), who reported *F. heterogenea* for the first time from Mexico in El Cielo Biosphere Reserve. Nannfeldt (1975) and San Martín (1996) considered it synonymous with *Nitschkia broomeana* (Berk.) Nannf., but *Nitschkia* species have octosporous asci, while *Fracchiaea* species have multisporous asci. We follow these criteria. The anamorph is not known yet.

Sordariomycetes, Hypocreales, Bionectriaceae

****Bionectria byssicola*** (Berk. & Broome) Schroers & Samuels, Z. Mykol. 63: 152 (1997) Figs 7, 8

Perithecia 290–400 µm diam., globose to subglobose, orange to pink when fresh, pale yellowish and laterally depressed when mature; no color change in KOH. Wall with whitish verrucae, 25–35 µm thick, dark red, textura epidermoidea, cells 10.4–12.8 × 8–12.8 µm. Asci 65–70 × 6–8.4 µm, clavate, with a visible apical ring in LB, hyaline, octosporous, uniseriate. Ascospores 13.6–15.2 × 4.8–5.6 µm, ellipsoidal to oblong, with a septum in the middle, hyaline, thin-walled, finely spinulose.

Specimen examined: **MEXICO, Sonora:** Rancho La Sierrita, 15 Oct 2013, R. Valenzuela 15272.

Habitat & distribution—*Bionectria byssicola,* which grows gregariously on trunks of newly fallen trees, has been cited from China, Taiwan, and Costa Rica (Nong & Zhuang 2005, Guu et al. 2010, Chaverri et al. 2011). In México it has been reported from the National Park Lagunas de Chacahua, Oaxaca (Raymundo et al. 2014). First record for the Sonoran mycobiota.

Comments—*Bionectria byssicola* is characterized by its orange to pink perithecia with whitish verrucae that change to pale yellowish in KOH. The anamorph [described as *Clonostachys byssicola* Schroers] forms sporodochia with curved conidia. Our Sonoran material matches the descriptions of Chinese and Taiwanese material (Chaverri et al. 2011, Guu et al. 2010). A similar species is *B. grammicospora* (Ferd. & Winge) Schroers & Samuels, which differs by its orange perithecia that do not change color in KOH, ascospores of 12.8–13.6 × 4.4–4.8 µm, and by the synnema in its anamorph [described as *Clonostachys grammicospora* Schroers & Samuels] (Schroers & Samuels 1997).

Sordariomycetes, Hypocreales, Nectriaceae

****Pseudocosmospora vilior*** (Starbäck) C. Herrera & P. Chaverri, Mycologia 105: 1301 (2013) Figs 9, 10

Perithecia 209–248 × 171–199.5 µm, obpyriform, red changing to dark red in KOH, smooth, inconspicuous stroma. Neck 95–110.2 × 28.5–43.7 µm, occasional periphyses emerging from the ostiole (inconspicuous to the naked eye). Wall smooth, 20–40 µm thick, orange or yellowish in LB, textura epidermoidea; cells 8–12 × 2.4–4.8 µm. Asci 50.4–57.6 × 5.4–6.4 µm, cylindrical, without apparent apical apparatus, hyaline, octosporous, uniseriate. Ascospores 6.4–8.4 × 4–5.6 µm, ellipsoidal, constrained by a central septum, hyaline to yellowish, thin-walled, verrucose.

Specimen examined: **MEXICO, Sonora:** El Cajón, 14 Oct 2013, T. Raymundo 4808.

Habitat & distribution—*Pseudocosmospora vilior* grows gregariously on the surface of *Xylariaceae*. It has been recorded from China, Taiwan, and Costa Rica (Nong & Zhuang 2005, Guu et al. 2007, Chaverri et al. 2011). In México it has been reported from the National Park Lagunas de Chacahua, Oaxaca (Raymundo et al. 2014). It is cited for the first time for Sonora.

Comments—*Pseudocosmospora vilior* is characterized by smooth red perithecia that change to dark red with a white ostiole in KOH. Our Sonoran material matches the descriptions of Costa Rican and Taiwanese material (Chaverri et al. 2011, Guu et al. 2007). *Cosmospora flammea* (Tul. & C. Tul.) Rossman & Samuels is similar, but produces perithecia that emerge in dense clusters from wood or scale insects and ascospores of 16–20 × 7.5–10 µm (Herrera et al. 2013). *Macroconia gigas* (J. Luo & W.Y. Zhuang) Gräfenhan & Seifert is also similar, differing by its perithecia with yellowish trichomes and larger (13.5–23 × 5.5–7 µm) ascospores (Luo & Zhuang 2007).

Sordariomycetes, Xylariales, Diatrypaceae

****Peroneutypa scoparia*** (Schwein.) Carmarán & A.I. Romero, Fungal Diversity 23: 84 (2006) Figs 11, 12

= *Peroneutypa heteracantha* (Sacc.) Berl., Icon. Fung. 3: 81 (1902)

Stromata 3–5 mm diam., pustuliform, black, erumpent, semicircular, with small bulges formed by 3–13 perithecia per stroma, monostichous or polystichous. Perithecia 400–600 µm diam., globose to ovoid, with thick black wall and surrounded by xylem tissue. Necks 800–1200 × 80–120 µm, extending conspicuously above the stroma, with cruciform ostiolar openings, surrounded by a velvety layer of yellowish to pale brown mycelia. Asci 10–18

× 4–5 µm, clavate, octosporous with amyloid apical ring. Ascospores 4–5 × 1–1.5 µm, pale yellow in KOH, greenish in mass, moderately allantoid, with two lipid droplets at the ends, aggregated to biseriate in the ascus.

Specimen examined: **MEXICO, Sonora:** Rancho La Sierrita, 15 Oct 2013, T. Raymundo 4857.

Habitat & distribution—This species grows gregariously on decaying debarked wood in tropical dry forests. Reported from Africa, Europe, Asia, North America, and South America (Rappaz 1987). In Mexico, *P. scoparia* has been reported from México City, Morelos, Nuevo León, Oaxaca, San Luis Potosí, and Tamaulipas (Pérez-Silva 1986, as *P. heteracantha*; Chacón 2003; Carmarán et al. 2006; Raymundo et al. 2014). This is the first record for Sonora.

Comments—*Peroneutypa scoparia* is characterized by pustuliform erumpent stromata and by perithecia with prominent and cruciform ostiolar necks at the apex. Our Sonoran material matches the description of Rappaz (1987). A similar species is *Eutypella portoricensis* (Petr.) Rappaz, with similar stromata, prominent but thin ostiolar necks, and larger (4–7 × 1.5–1.8 µm) ascospores (Rappaz 1987).

Sordariomycetes, Xylariales, Xylariaceae

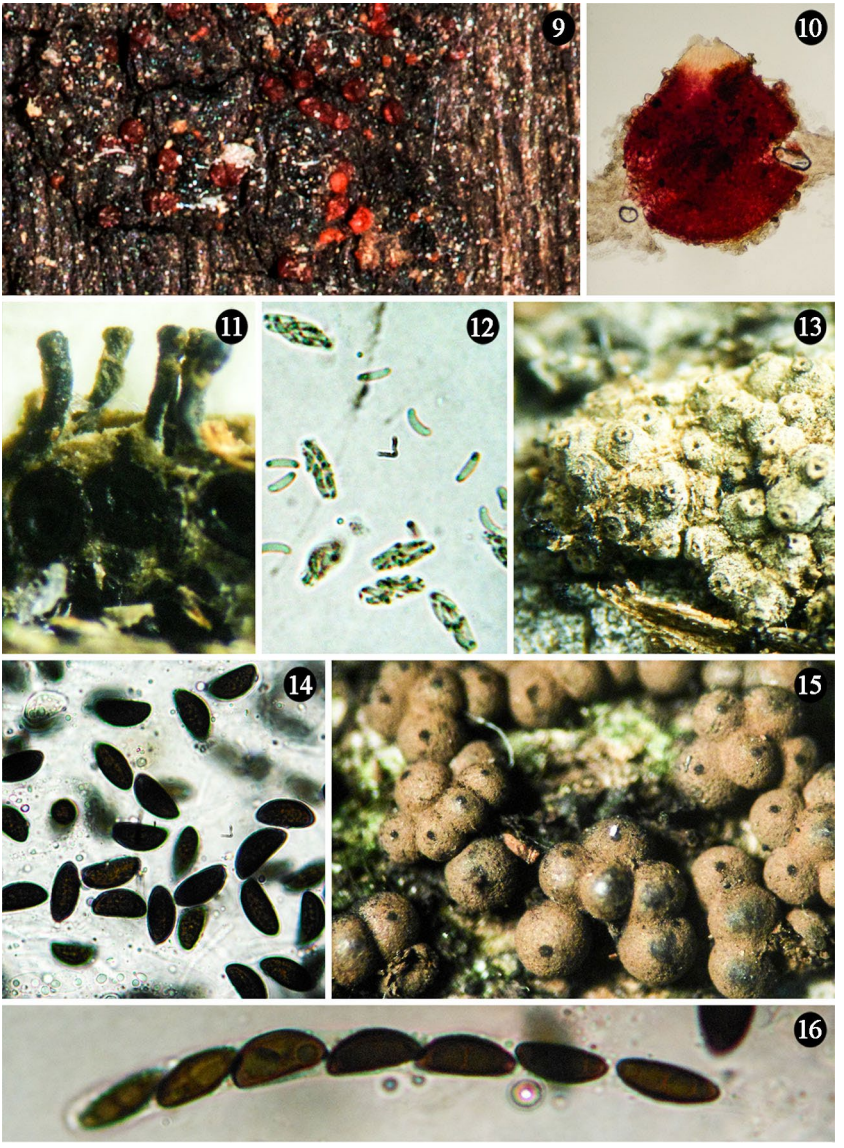
*****Hypoxylon anomalum*** J.D. Rogers, Y.M. Ju & Oses,
Mycologia 97: 562 (2005) Figs 13, 14

Stroma 4–6 mm diam., aggregated, with grouped perithecia, conspicuous. The tissue between the perithecia is not to slightly conspicuous, pale orange. Perithecia 400–600 µm diam., obovoid, orange to ocher brown and glossy dark brown, releasing pale yellowish pigments in KOH. Ostioles with umbilicate surface. Asci 80–98 × 10–12 µm, stipes 40–66 µm long, apical ring 1.4–2 × 3–4 µm, discoid, inamyloid, octosporous, uniseriate. Ascospores 12–15.5 × 6.5–8 µm, inequilaterally ellipsoid, with broadly rounded ends, dark brown to black; rectilinear germinal aperture with dehiscent perisporium and smooth episporium.

Specimens examined: **MEXICO, Sonora:** El Cajón, 14 Oct 2013, T. Raymundo 4809; Rancho La Sierrita, 15 Oct 2013, R. Valenzuela 15249.

Habitat & distribution—*Hypoxylon anomalum* grows gregariously on decaying branches. Reported in Costa Rica (Ju et al. 2005); it is recorded for the first time for México.

Comments—Our Mexican material matches the description of *H. anomalum* by Ju et al. (2005). A similar species, *Hypoxylon olliforme* San Martín et al., is



Figs 9–16. ***Pseudocosmospora vilior***. 9. Perithecia in *Hypoxylon*. 10. Perithecium in KOH. ***Peroneutypa scoparia***. 11. Stromata and perithecia. 12. Asci and ascospores. ***Hypoxylon anomalum***. 13. Stromata and perithecia. 14. Ascospores. ***Hypoxylon lenormandii***. 15. Stroma and perithecia. 16. Ascus and ascospores.

distinguished by its stroma that is effuse, pulvinate to rosellinoid, reddish brown and releasing reddish orange pigments in KOH, globose (200–300 µm diam.) perithecia, and ascospores that are 10.5–12 × 4.5–5 µm, dark brown, ellipsoidal (San Martín et al. 1999d).

***Hypoxylon lenormandii** Berk. & M.A. Curtis,
J. Linn. Soc., Bot. 10: 385 (1868 ["1869"]) Figs 15, 16

Stroma 1500–10000 × 800–4000 × 1.5–2 mm, flat to effuse-pulvinate; perithecia not to slightly conspicuous, surface violet to violet brown with dark granules, sepia when mature, with removable yellowish green to olive pigments. The tissue between the perithecia is inconspicuous to slightly conspicuous, black, 200–700 µm thick. Perithecia 500–1000 × 300–400 µm, tubular, black, with ostioles below the stromal surface opening the stromal layer. Asci 72–98 × 4.5–6 µm, with 28–56 µm long stipes, apical ring of 1.4–2 × 3–4 µm, discoid, amyloid, octosporous, uniseriate. Ascospores 7–9 (–12) × 3.5–5.5 µm, ellipsoidal with broadly rounded ends, dark brown, rectilinear germinal aperture with indehiscent perisporium and smooth episporium.

Specimen examined: **MEXICO, Sonora: El Cajón**, 14 Oct 2013, D. Castro-Bustos 129, 144.

Habitat & distribution—*Hypoxylon lenormandii* grows gregariously on decaying branches and trunks from fallen trees. Recorded in United States (Vasilyeva et al. 2007) and México, where it has been reported in Campeche, Chiapas, Nuevo León, Oaxaca, Quintana Roo, and Tamaulipas (San Martín et al. 1999c; Raymundo et al. 2014). This is the first record for Sonora.

Comments—Our Sonoran material of *H. lenormandii* matches the description by San Martín et al. (1999c) for Mexican specimens; it is mostly consistent with the United States specimens, which have somewhat larger (10–15 × 4–6.5 µm) ascospores (Vasilyeva et al. 2007).

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